SOURCES OF AMERICAN POTASH

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THE American potash industry is largely the outgrowth of war conditions. Prior to the European war the amount of potash used in the United States amounted to about 1,000,000 gross tons of the salts, containing about 250,000 tons of pure potassium oxid, or potash. Practically all of this potash came from Germany, and about 95 per cent of the amount imported was used in agriculture. In 1914 potash was selling in the United States at approximately 75 cents per unit (20 pounds of potash), the average wholesale price at Atlantic ports.

Potash is essential to the best development of many crop plants, and therefore must be supplied as a fertilizer ingredient where the soil does not contain a sufficient quantity of it. During the war imports were very much curtailed, and many crops previously supplied with potash had to be grown without this fertilizer ingredient. The following table shows the imports and domestic production of potash expressed as K_2O from 1913 to 1918:

Imports and domestic production of potash, 1913 to 1918, inclusive.

Year.	Imports.	Domestic production.	Year.	Imports.	Domestic production.
	Tons.[1]	*Tons.*[1]		*Tons.*[1]	*Tons.*[1]
1913	270,720	Nominal.	1916	7,885	9,720
1914	207,089	Nominal.	1917	8,100	32,573
1915	48,867	1,090	1918	7,957	54,562

[1] Tons of 2,000 pounds.

It may be seen from this table that small amounts of potash were imported during the war period and that our production, which was purely nominal before the war, rose to 54,000 tons in 1918. The domestic potash industry was stimulated by a shortage of material and prevailing high prices. The average selling price of American potash in 1918 was $4.11 per unit (20 pounds) f. o. b. plant. The amount of capital invested in this industry has been variously estimated and is believed to be between $20,000,000 and $30,000,000. The following table indicates the sources of potash in the United States,

the actual production from these sources during 1916, 1917, and 1918, and the estimated capacity of the producing plants at the close of 1918.

Production of potash in 1916, 1917, and 1918, with estimated capacity at the close of 1918, showing sources of supply.

Source.	Actual production of potash (K_2O).			Estimated capacity.
	1916	1917	1918	
Natural brines:	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Nebraska lakes	.....	14,558	28,854	50,000
Searles Lake, etc	3,994	6,092	10,862	28,000
By-product sources:				
Dust from cement mills	.....	1,621	1,549	[1] 3,500
Dust from blast furnace	.....	185	230	[2]
Molasses distillery waste	1,845	2,846	3,467	4,000
Waste liquors from beet sugar refineries	.....	369	1,213	3,000
Miscellaneous sources:				
Alunite	1,850	2,402	2,621	4,000
Kelp	1,556	3,572	4,804	5,500
Wood ashes	412	621	673	1,000
Other	63	305	289	1,000
Total	9,720	32,571	54,562	100,000

[1] Data incomplete—minimum capacity. [2] Small—information lacking.

In weighing the possibility of output of potash from any given source, in competition with foreign potash, due consideration must be given to the cost of transportation to the agricultural regions where the product is used.

Of the plants operating in this country there are nine large ones in Nebraska and two at Searles Lake. The capacity of plants constructed in these two regions amounts to about 75,000 tons. There are 14 cement mills that have installed apparatus for collecting potash from mill dust; two blast furnaces have similar plants in operation; five molasses distilleries are recovering potash from their waste; a number of beet sugar refineries have recovered small amounts of potash; two plants in New York and New Jersey are operating to produce potash from green sand; one plant is under construction for recovering potash from Georgia shales; one plant near Marysvale, Utah, is using alunite as a source of potash, and four large plants and several smaller ones along the Pacific coast were constructed and operated during the war for the recovery of potash from kelp. Statements concerning the production of potash from these different sources follow:

NATURAL BRINES.

Nebraska.—Although the saline lakes of Nebraska have furnished the largest domestic supply of potash, they contain altogether only a few hundred thousand tons of potash (K_2O) (associated with soda), and it is estimated that at the present rate of extraction the supply

will be exhausted in about 10 years. Nine large plants and a number of small ones are in operation or ready to operate. The annual capacity of these plants is about 50,000 tons of actual potash (K_2O). The competitive position of this source is weakened by the high cost of extracting and marketing the product. The deposits are widely scattered over an area of more than 800 square miles, and the potash is obtained from sands underlying small lakes at a depth of about 12 feet.

Searles Lake.—Searles Lake, Calif., is the third largest source of soluble potassium salts known in the world. It has 20,000,000 tons of potash (K_2O) in natural saturated brines. Production began in 1916, and the annual capacity of the two producing plants now in operation is about 25,000 tons of actual potash, which is marketed in the form of salts containing 40 per cent K_2O. Soda ash, borax, common salt, and sodium sulphate are associated with the potash, and if recovered might lessen the cost of the potash. Reports have been received regarding serious injury to crops resulting from the use of potash fertilizers containing considerable percentages of borax, and at the present time it is not possible to say to what degree the borax must be removed in order to make this potash satisfactory for agricultural purposes.

BY-PRODUCT SOURCES.

Cement.—About 75,000 tons of potash (K_2O) could be recovered annually from cement mills of the United States if they were equipped with proper plants. More than 70 per cent of the cement output is produced in States east of the Mississippi River and contiguous to the consumption centers of potash. The operating costs will presumably be low and the recovery of potash dust will abate a serious nuisance. Up to the present the considerable investment involved and the small proceeds compared to the value of the cement produced have delayed installation.

Blast furnaces.—The recovery of by-product potash from blast furnaces is a large potential source of supply located near the center of potash consumption. The present estimates of the potash recoverable from this source are very inconclusive and range from 50,000 to 200,000 tons of K_2O annually. Plants now being installed are expected to demonstrate the feasibility of recovery from this source at prices which will compete with foreign potash. Blast furnace gases are ordinarily subjected to a cleaning process and are then used as fuel. The cleaning of the blast furnace gases, which is done effectively by potash recovery plants, is an important factor in making the recovery of potash from this source profitable.

Molasses distilleries.—Potash (K_2O) in the waste waters from about 25 distilleries using molasses for the production of industrial alcohol amounts to about 30,000 tons annually. Five plants are now equipped to recover potash from this source.

Beet-sugar refineries.—The potash (K_2O) recoverable from waste waters in beet-sugar refineries amounts to 8,000 tons or more annually. Most of these plants are located in western States.

SILICATE ROCKS.

Processes for the extraction of potash from silicate rocks are being subjected to large-scale manufacturing tests. If these tests show the feasibility of obtaining potash from this source, the opportunities for developement in sections of the Eastern United States adjacent to markets would be limited solely by the demand for potash.

Greensand.—The greensand deposits of New Jersey are estimated to contain two billion tons of potash (K_2O). Two plants are now operating on greensand. The process includes the manufacture of building bricks as a by-product and thus has the advantage of supplying two valuable commodities close to a market with demand of large proportions.

Georgia shales.—Vast deposits of shales in Georgia contain about 9 per cent potash (K_2O), and plans have been made for the construction of a plant to develop them.

Leucite.—The Leucite Hills of Wyoming are estimated to contain two hundred million tons of potash (K_2O). The potash content of this rock averages about 12 per cent. A million-dollar plant using this material is about ready to operate. The principal handicap in developing this source of supply is the distance from southern and eastern markets and the high freight rates.

MISCELLANEOUS SOURCES.

Alunite.—Several hundred thousand tons of alunite rock are available in Utah for potash production, and three potash plants have been constructed there. Sulphuric acid and alumina are possible by-products. The technical difficulties of extraction are not serious, but the deposits are in a mountainous country, requiring expensive tramways to bring the ore to mill. As in case of leucite, the finished product must meet the handicap of high freight rates to eastern markets.

Kelp.—Large quantities of kelp are available on the Pacific coast. Ten potash plants were constructed for utilizing kelp, most of which have been closed. The total capacity of the plants was about 5,000 tons of potash (K_2O) per annum. The revival of the industry depends on the recovery of by-products, such as iodine, acetone, ammonia, and charcoal. Methods under investigation which will be

economical in the utilization of heat and recover valuable by-products give promise that it will be profitable to utilize kelp as a source of potash.

PRESENT STATUS AND OUTLOOK OF THE INDUSTRY.

So far as the Bureau of Soils is informed, no cost data concerning the production of American potash are available. It is estimated that there are now on hand between 15,000 and 20,000 tons of American potash. The domestic consumption of potash during the next year will depend upon several factors as yet undetermined.

The situation regarding American potash seems to be this: The war created a shortage of potash, and acting under the stimulus of the demand caused by this shortage and of the accompanying high prices some manufacturers produced potash partly to meet the demand. This potash was obtained mainly from materials yielding it most readily, namely, from salines located in the West. By-product sources were developed somewhat, but as these required considerably more experimentation to solve technical problems the quantities produced from these sources were comparatively small. With the return of normal prices, the western producers will be handicapped by high freight rates to the eastern or fertilizer markets. The production of by-product potash, with the gradual solving of the technical details of the processes, therefore may offer most hope for a steady development of a permanent American supply. The main by-product sources have the advantage of being located close to the regions where fertilizers are consumed.

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